LOAD CELL TROUBLESHOOTING

The following tests can be used to determine if a load cell system is operating correctly, or is need of repair:

CORNER TESTING

Place a known weight at various locations on the weigh vessel. The instrument should indicate the same weight at all locations. In a free standing vessel with no binding the maximum error should be less than 0.02 percent of system load cell capacity.

REPEATABILITY

Record the current weight indication. Place a known weight on the weigh vessel. Mark the location. Record the weight. Remove the weight. Repeat these steps. The maximum none repeatability of a freestanding vessel with no binding should be less than 0.01 percent of system load cell capacity.

PHYSICAL INSPECTION

If a load cell is rusted, corroded or badly oxidized it is likely the contamination has worked its way into the strain gage area. If the physical condition appears good, look at sealing areas and the cable. All area of the load cell is sealed for protection from water and chemicals. Check the strain gage seals and the load cell cable entrance for signs of contamination. The load cell cable must be free of cuts, crimps, and abrasions. Water can wick up the cable causing improper equipment readings.

ELECTRICAL TESTS

If you have the Integrated Technician feature available, you can read the millivolt readings from the front panel display. If you do not have Integrated Technician, you would need to use a Digital Multi-Meter (DMM). Electrical testing using a DMM is performed with the excitation leads connected to the weight controller and the signal leads disconnected. Readings are taken between the positive and negative signal leads of each load cell to ensure that:
1. Each load cell is producing a millivolt output.
2. The millivolt output is stable.
3. All load cells in the system are producing approximately the same millivolt output.
4. The goal is a plus or minus 1 millivolt.
5. No signal exceeds 15 millivolts under a full load condition, or for a HI 2151/20WC it should not exceed 30 millivolts.

**ZERO BALANCE**

To determine if a load cell has physical distortion, caused by, overload, shock load or metal fatigue check the "zero balance". To perform this procedure the load cell must be in a "no load" condition, removed from the weigh vessel. With no weight on the load cell and the excitation leads connected, lift the signal leads and measure the voltage between the positive and negative signal leads. This output must be less than the manufacturers specification, usually 1% of full scale. With 10 volts excitation and a 3mV/V load cell the maximum signal is 0.3 millivolts.

**RESISTANCE TO GROUND**

Electrical "leakage" is almost always caused by water within the load cell or cable. The first indication is usually a weight controller that is unstable, (the weight readings are constantly in motion). To verify moisture problems use a low voltage megohm meter (megger). CAUTION: A megger which puts over 50 volts into the cell will damage the strain gauges. Test between each lead and the load cell metal body. If the readings are not all over 5000 Meg ohms current is leaking through a break in cable insulation or inside the gauge cavity.

**BRIDGE RESISTANCE**

To test "Bridge Resistance" the load cell must be in a "no load" condition, removed from the weigh vessel. It must also be disconnected from the weight controller. Measure between the excitation leads for input resistance and the signal leads for output resistance. Compare these readings to the load cell specifications. Even if the input and output resistance checks are within Normal specifications it is still possible to have a damaged load cell. When a load cell is damaged by overload or shock load, opposite pairs of resistors will be deformed by the stress, equally, but in opposite directions. The method to determine this failure is to take resistance readings of each individual leg of the bridge.

The following Wheatstone bridge diagram illustrates a load cell resistance bridge. The legs in compression are C1 and C2. The legs in tension are T1 and T2. In a good load cell in a "no load" condition the following resistance relationships will be true.
• \( C_1 = T_2 \)
• \( T_1 = C_2 \)
• \( C_1 + T_1) = (C_2 + T_2) \)